after one trial of this *spectral* music, to take refuge in the awful solitudes described by Dante:—

> " —— dove *il Sol tace*."

Trinity College, Cambridge SEDLEY TAYLOR

Solar Spots Visible to the Naked Eye

OWING to the smoke and clouds which generally obscure the sky at Glasgow, opportunities to observe the phenomena of the heavens are very rare.

When gazing at the sun this morning (February 16th), I observed on its disc a dark line on the upper half of the disc. In order to convince myself that it was not a delusion, I directed a small pocket telescope (magnifying power about six times linear) and observed several spots. The principal one, as near as I could guess, was 5′ long by 1′ broad.

I would be glad to hear the extent of it from any one of your correspondents, who has measured it, as it must have been of enormous dimensions.

Argyle Street, Glasgow ROBERT M'CLURE

[The dimensions of this spot have been taken by M. Tremischini, who communicated his observations to the French Academy of Sciences at the meeting on the 14th inst., as will be seen from our report of the proceedings further on.—ED.]

Flight of Birds

IN reply to J. H.'s query respecting the flight of the albatross mentioned in a paper of mine on the flight of birds, read at the November meeting of the Norfolk and Norwich Naturalists' Society, I beg to assure him that no bird is able to fly without flapping its wings.

The birds observed by your correspondent's brother were performing one of the most beautiful feats of "wingmanship"—a feat which can only be indulged in, to any extent, by birds possessed of a superabundance of wing-power. The albatross is the great master of this style of flight. Having by repeated flappings of the wings raised itself into the air, and acquired a certain degree of velocity, it brings its body and outstretched wings to such an angle that the pressure of the breeze against its surface is sufficient, or nearly so, to neutralise the force of gravity; it can then "sail" on as long as the momentum lasts. It has been known to sail in this way, with the wings and body perfectly motionless, for more than an hour (though this is an unusually long time), and when the momentum becomes exhausted, a few strokes of the wing are sufficient to restore it. From its frequent indulgence in this sailing flight, the albatross may be said seldom to flap its wings, but certainly cannot be said *never* to do so.

Inserting this explanation may be what J. H. requires.

Norwich, February 7 T. SOUTHWELL

Relations of the State to Scientific Research

As an old worker in science, and as one who, had Nature not been unkind, might have been eminent, I desire to say a few words on the relations of the State to Scientific Research, a matter likely, I understand, to be the subject of a "Commission."

I take it for granted that it is a natural and proper function of the State to assist and develop labours, the results of which are of national importance, though their market value cannot be satisfactorily ascertained at the time they are being carried on, and therefore they can seldom be immediately remunerative. Of the seed sown to-day, the nation will reap in years to come, long after the sower is dead and gone. It is only right that the nation should help in the sowing. To continue, as of old, merely to reap where others have sown, may seem good in the sight of temporising politicians; but it will not seem so when there comes to be a scanty harvest by reason of the sowers having been feeble and few. It was bad political philosophy when the rulers of the great city overlooked the poor wise man.

But what I wish more particularly to deal with now, is the manner in which the State can best perform this acknowledged duty. In what way can Government most beneficially interfere with the spontaneous energy of original scientific labourers? And this I confess is a matter of no little difficulty. Let us suppose that a certain large sum of money should be set aside, in order to enable a large body of elect men to prosecute original inquiries undisturbed by the bark of the wolf at the door; in other words, let us suppose that Government pays directly for simple scientific investigation. In that case, such elect men will either have to work by the piece, being paid for and by their results when they have brought them forward, or they will have to receive a salary, —to be paid beforehand for work which they will be expected to do. The former plan is, in the first place, impracticable, for the simple reason that the value of the work cannot be satisfactorily gauged,—in the second place it would be most pernicious, and inevitably bring about a deluge of delusions. It would be a gigantic system of prize essays, and we all know that nothing but lies and nonsense proceed out of the mouths of prize essays.

The second plan flies in the face of a fundamental law of human nature. Suppose a hundred men to receive each, say, seven hundred a year, paid quarterly, in order that they may devote themselves to original research. How much of the divine afflatus would list to come into the minds of ninety and nine of them? The morning after they had received their quarter's salary, they would take up their apparatus and sit down by the side of the pool waiting till the waters should be stirred. But the stirring would never come. They would always be paulo-post-futurists; they would ever be writing title-pages of books that would never be seen. They would become admirable critics, keenly sensitive of the follies and errors of the pushing, squabbling, busy, outside mob of unpaid workers; but they, the ninety and nine, would not produce. As they grew old they would ask permission to retain their salaries while they went to live in a land in "which it always seemed afternoon." And when they, the first batch, died, those who succeeded them would boldly declare, as I am told the Fellows of the old Universities do, that they were paid not for the work of which their ability gave promise, but as a reward for having shown themselves worthy of filling the posts. The one man who would do any work at all would be the man who would find the greatest difficulty of getting into the guild, and he, most probably, would only get in by accident after all.

There may be a little exaggeration in the above. As an old man I am prone to be garrulous; but of this I feel above all things assured, that in all the higher functions of the scientific man, in all work that is not mechanical, help from Government or from elsewhere must be given—not directly and in exchange for actual scientific work, but indirectly for some other tasks that do not demand original thought—and given in such a way that active private research may comfortably be carried on at the same time.

In the good old times when the ties which bound together State and Church were not such ticklish ties as now, they used to reward abstract unremunerative learning indirectly by bestowing on it the rich offices of religion. Greek and philosophy took the bishoprics which rightly belonged to piety.

It is possible for science to copy the indirectness and yet to avoid the injustice of this old method; to retain the good while rejecting the evil of such a method of payment *not* by results. How such a plan may be carried out, I will venture with your permission, Sir, to trace in a succeeding letter.

IN SICCO

NOTES

IN the last number of the *Revue des Cours Scientifiques*, M. Alglave again announces further subscriptions to the Sars Fund amounting to 40*l*., half this sum being a prize awarded by the Zoological Society of Paris in recognition of Sars's works.

M. STAS has been elected director of the Classe des Sciences in the Royal Academy of Belgium.

A DEPUTATION consisting of Earl Fortescue, the Right Hon. C. B. Adderley, Dr. Farr, and others, had an interview with Mr. Shaw-Lefevre at the Board of Trade on Saturday to recommend the legalisation of metric weights and measures in the Post Office, and the legal substitution of metric weights for the troy weight which the Standard Commissioners propose to abolish.

ALL who are interested in the science of ethnology in this country, and their number is daily on the increase, will be glad to learn that the Council of the Royal College of Surgeons are in treaty with Dr. Nicolucci of Nola di Sora, for the purchase of his fine collection of Italian and Greek skulls. This collection, comprising 165 specimens of ancient and modern crania, upon which the celebrated Italian ethnologist's well-known researches into the history of the races of Southern Europe have been mainly founded, will prove a valuable acquisition to the already extensive series in the Hunterian Museum.

MR. SCOTT, the Director of the Meteorological Office, has requested us to state that the French minister of the marine department has made arrangements for hoisting the "drum" signal at all semaphore stations on the French coast, between Dunkerque and Nantes, on receipt of telegraphic intelligence from the Meteorological Office. This signal will, therefore, have the same significance at those ports as on the Elbe and at our own stations. Herr von Freeden in the report of the Norddeutsche Seewarte states, that out of thirty telegrams which might be considered real storm-warnings, there were thirteen instances when the storm followed the same evening or next day; four when it was the previous day (in three of these instances a Sunday intervened and no telegram could be sent), six instances when the weather proved squally, and seven when it remained fine. On two occasions no telegram was received; in one of them on account of an interruption of the wires. As the result of observation, Herr von Freeden considers that the N.W. gales take a southerly direction from Ireland towards the Bay of Biscay, and therefore, do not affect the mouth of the Elbe. He also thinks further investigation would show a connection between them and S.W. winds, further westward, which have been blowing hard before reaching the Channel and have veered to N.W., though not enough to exclude the British Isles from their effect, while in North Germany the compensating current comes from S.E. These facts are of value in showing the utility of the system of "Weather telegraphy" instituted by the Meteorological Committee of the Royal Society.

WE have just received from Herr F. von Hauer the three first sheets of his geological map of the Austro-Hungarian Empire, compiled from the Survey of the Geological Institute; also a map by Mr. Foetterle, showing the occurrence, production, and distribution of coal in Austria. The subsequent sheets of the geological map are in the press and will appear in a few weeks.

AT the dinner of the Foremen Engineers on Saturday, Sir J. Whitworth referring to the depressed state of trade and the signs of improvement that are visible, observed that the progress made during the last forty years in the construction of self-acting machinery has been very remarkable. Twelve shillings a foot was formerly paid for the labour of chipping and filing iron surfaces and it was now done by the planing-machine for a penny. Mr. Bessemer's method of making steel has reduced the cost of some kinds of steel to one-half or one-third what it was. The consumption of coal for manufactures has been reduced more than one-half. The saving on English railways last year by using coal instead of coke was 1,200,000*l.* Mechanical and civil engineers, chemists, and other scientific men, are continually finding out new modes of producing wealth, and the owners of self-acting machinery generally go on improving and increasing their productions, from which those who have fixed incomes derive great advantage. The full employment of such machinery required a free exchange of the produce of all countries. Engineers have so reduced the cost and time of transit that when we have that free exchange, England will probably be the cheapest country in the world to live in. Sir Joseph went on to say, that looking to the immediate future, we may congratulate ourselves on the great opportunity arising for the development of engineering enterprise. The cultivation of land by steam power is greatly on the increase. In regard to the use of horse tramways now being urgently pressed forward, Sir Joseph protested that they were not suited to the present time. He considered that if toll gates were abolished, and roads kept in good order, engineers would soon produce a small, light locomotive that would do its work quietly and efficiently. The consumption of fuel per horse-power is now so small that road locomotives could be employed at far less cost than horses.

WE learn from *L'Institut* that M. Tchibatcheff has published the eighth and last volume of his work on the physical geography, climatology, botany, geology, and palæontology of Asia Minor. The fossils described in this volume belong chiefly to the Devonian tertiary and quaternary series. The Jurassic rocks are represented by only four ammonites found near Angora; the cretaceous rocks by twenty-seven different species, the Devonian by seventy-nine, and the carboniferous by fourteen. The remainder of the 604 species in Asia Minor belong to the tertiary or quaternary rocks. An appendix contains descriptions of fossils found in Devonian strata near Constantinople by Colonel Abdullah Bey. The knowledge of the fossils of Asia Minor, furnished by this work, does not introduce any change in the views previously entertained. The succession of organisms at different epochs has been the same in Asia Minor as in other countries already studied in this respect.

THE *Athenæum* states that the Rev. A. E. Eaton, of Trinity College, Cambridge, is preparing a monograph on the Ephemeridæ, or May-flies, in two parts. Part I. (which will treat of their generic and special nomenclature) is to contain a chronological catalogue of authorities and a synonymic alphabetical index to their works, descriptions of the known genera and species, figures of some organs characteristic of the genera and drawings of many of the species. Part II. will be occupied with an account of the anatomy and development of one or more characteristic British species.

THE Melbourne correspondent of the *Times* remarks, that as a partial set-off against the rabbit and sparrow scourges resulting from ill-considered introductions of European animals to Australia, we now and then light on what seems a new fact in natural history. Among other importations is the ostrich, and being a strong, long-legged bird of uncertain temper, it was deemed unsafe company for children and nurses in the Park. The Acclimatisation Society, therefore, fixed an inquisitive and zoological squatter with the flock of ostriches up country, where he was to look after the birds. Mr. S. Wilson, writing from his station at Longeranong, informs the Society that twelve young birds have been hatched in one nest, and "are getting on nicely." Referring to a common notion, derived from such books as "Goldsmith's Natural History," that the ostrich lays her eggs in the sand, leaving them to be hatched by the heat of the sun, Mr. Wilson says that during the period of incubation —about six weeks—the male and female sit on the nest by turns, both being seldom absent at the same time. As it is not to be assumed that the ostrich departs from its natural domestic arrangements in a new country, we must believe that the female has been hitherto commonly maligned, and the peculiar virtues of her husband altogether overlooked. Another nest of eleven eggs came to no good, as they were laid too early in the winter. The nest is "in a sandy hollow, without grass or rubbish, and the eggs are entirely without any cover."

AT the meeting of the Linnean Society, held Feb. 17, a paper was read by Mr. C. B. Clark on the *Commylenaceæ* of Bengal, of which order he proposes a new system of classification, based on characters of the capsules and the seeds; a paper on the Tree-Ferns of British Sikkim by Mr. Scott, which comprise eight indigenous species belonging to the genera *Cyathea, Hemitelia*, and *Alsophila*, an intoxicating drink being obtained by the natives from three different species; and an interesting letter addressed to Dr. Hooker by Dr. Hunce, from Whampoa near Canton, on the Flora of some little investigated districts in that neighbourhood.

WE have to record the decease of Mr. J. E. Sowerby, so well-known in connection with the illustration of botanical works, especially the new edition of the English Flora, edited by Mr. J. Boswell-Syme, now nearly completed.

The Professorship of Medical Jurisprudence in the Royal College of Surgeons, Ireland, is vacant by the death of Dr. Geoghegan. The election by the Council was to take place on the 17th inst.

During the recent discussion on Easter Island at the Royal Geographical Society, it was stated that the layers of guano could be traced and the deposit of each twenty-four hours distinguished. It was calculated that it must have taken 4,000 years to form the 20 feet deposits on the Chincha Islands.

The town of Dantzic having given a concession of the sewage to Messrs. Aird of Berlin and granted them land for its utilisation, preparations are now being made for carrying out the work under the direction of Mr. Baldwin Latham.

We have received a report of the Birmingham Natural History and Microscopical Society, which appears to be actively at work, and we notice that Mr. Fiddian read a paper, of which he has sent us a copy, on a "Screw Motion" to remedy the defects in the adjustment of compound microscopes.

The *Bulletin de la Société d'Acclimatation* contains an article on the use of the skins of the Kangaroo for glove-making, which seems to promise a successful result in this respect, and as furnishing a new source of animal food, as these animals thrive well in Europe.

The Warsop aero-steam engine has lately been much talked of, and was the other day prominently described in the *Times*. The invention consists essentially in mixing heated air with the steam before its admission into the engine, and results have been obtained which show considerable advantages in the case of certain engines and boilers. *Engineering* referring to the subject remarks, that it is to be regretted that those interested in the invention should not have afforded means of judging whether its application to engines of an economical class would furnish results as satisfactory as those obtained with the defective boiler of the *Fox*.

A correspondent in the *Society of Arts Journal* suggests the necessity of a new house for that body, with sufficient room for an extensive library and museum, and adds, that if a hundred of our trade magnates were to set down their names for 1,000*l*. each, the object would be accomplished, and they would be the Greshams of a New Exchange, where art and science would incessantly supplement and extend an ever-growing commerce, and lessen the sphere of human want.

The *British Medical Journal*, referring to the general impression that the mortality attending the larger operations performed in hospitals has diminished during the last two or three years, suggests that if this be due to really improved plans of treatment, the introduction and free use of carbolic acid may have been one of the measures most influential, and recommends the use of this material in hospitals for preventing accidental contagion.

We have received, from the Editor, the "Year Book of Photography, and Photographic News Almanac for 1870," containing a number of interesting and useful papers and memoranda.

The *Journal of the Society of Arts* states that application has been made by the French Government for plans and statements relating to the organisation of the South Kensington Museum and Schools. Schemes based on the same principle and method have, it is understood, been proposed in New York and Boston.

Captain Hans Busk has issued a circular in which he expresses his conviction that much may yet be done to diminish loss of life by shipwreck, and suggesting the construction of an experimental steam life-ship of 80 to 100 tons and 50 horse-power, capable of keeping the sea in any weather. An institute has been established for this purpose, and Captain Busk offers a donation of 200*l*. on condition that 1,400*l*. be contributed by the public towards the cost of the vessel during the present month. Upwards of 700*l*. has already been received. Subscriptions are to be sent to the Hon. Secretary, Major Wallace Campbell, or Captain Busk, 3, Garden Court, Temple, or to Messrs. Coutts' Bank.

We have received from the publishers the January number of the *North British Review*, in which we notice an admirable series of notices of contemporary literature, in which there are among the scientific works referred to Ångström's "Researches on the Solar Spectrum," Ladenburg's "History of Chemistry," Micé's "Report on the Progress of Chemistry," Odling's "Outlines," Foster's "Physical Geography of the Mississippi Valley," Sir J. Lubbock's "Pre-Historic Times," and Newman's "British Moths."

A method of protecting iron from atmospheric influences has been proposed by Messrs. Macmillan and Macgregor, of Dumbarton and Glasgow. They bring melted sulphur into contact with the cold metallic surface to be coated. The sulphur chills and sets into a hard, thin, protecting covering.

Mr. Ruggles states in his report to the International Statistical Congress held at the Hague that, in 1868, the extent of land under wheat, rye, barley, oats, buckwheat, and maize in the United States was upwards of sixty-six million acres, the cereal crop amounting to more than four times as much as was needed for the population of the country.

The Secretary of State for India announces, at the request of the Governor-General of India, that the Government of India offers a prize of 5,000*l*. for machinery or a method suitable for the separation of the fibre and bark of the Rheea or China-grass from the stem and for separating the fibre from the bark. Dried stems and specimens of the fibre will be suppled on application to the Secretary to the Government of India in the Home Department.

We learn from a paper by Mr. Bartley in the *Society of Arts Journal*, that Science classes, attended by artizans, were in active operation last year in Chelsea, Hampton, Knightsbridge, Nine Elms, and Wandsworth, the total number of students being 223. The Chelsea School has just been enlarged by the students themselves, working from six to eleven at night. It will accommodate 200, the outlay being 50*l*. for material. This school has now 206 students in all. They are taught by Mr. Bickerton—formerly a cabinet-maker in Gloucestershire—who has distinguished himself as a pupil at the Royal School of Mines. With the exception of a few prizes, no local aid of any kind has been given to the school.

We have received from Vienna the catalogue of a book-sale which is to take place during March, in which we notice the titles of many valuable works on Natural Science, History, Political Economy, Mathematics, &c., in various languages. Commissions for purchases are received by Messrs. Trübner in London.

A course of eight lectures on English History, from the accession of Edward III. to the date of the Council of Constance, is now being delivered in the Pimlico Rooms, by Archibald Milman, Esq., under the auspices of the Committee for the higher education of women.

A deputation from the Society of Arts waited upon Earl Grey and Mr. Forster at the Privy Council Office on Friday, to present a memorial representing in reference to the system of State aid to science classes, the hardship of the new orders which are looked upon by teachers as a breach of faith by the department. Lord De Grey promised to consider the matter carefully.

In consequence of the appointment of Mr. Dyer to the chair of Botany in the College of Science, Dublin, the Professorship of Natural History at the Royal Agricultural College at Cirencester is vacant.